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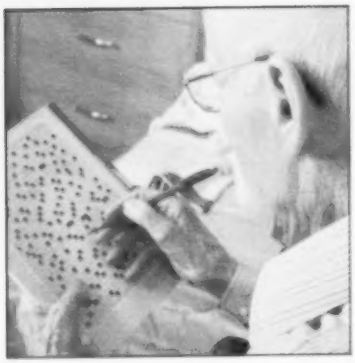
Article

Cognitive performance of Canadian seniors

by Heather Gilmour



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Abstract

With data from the 2009 Canadian Community Health Survey—Healthy Aging Cognition Module, five cognitive functioning categories based on normative values that adjust for age, sex and education were created. The two lowest categories were combined to identify seniors (65 or older) without Alzheimer's disease or dementia living in private households, who had low scores on four cognitive tasks: first recall, second recall, semantic fluency, and processing speed. Low income, not living with a spouse or partner, and diabetes were associated with low scores on each task. Heart disease, impairment in instrumental and daily activities, receiving home care, social participation, loneliness, and self-perceived general and mental health were also associated with low cognitive performance, although the associations differed by cognitive task.

Keywords

Accidental falls, activities of daily living, aging, cognition disorders, cross-sectional studies, health surveys, home care services, loneliness, memory disorders, mental recall, social alienation

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Cognition is "the mental process of knowing, including aspects such as awareness, perception, reasoning, and judgement."[1] Some decrease in cognition is expected at older ages, but the decline is not uniform across all cognitive tasks or for all individuals.[2] Impaired cognition can have health consequences, such as first stroke,[3] falls,[4] and institutionalization.[5] It may reduce an individual's ability to communicate pain to health care providers,[6] carry out instrumental activities of daily living,[7] and cope with chronic disease symptoms, perform self-care and adhere to medication instructions.[8-10]

Different aspects of cognition may have different influences on health. Some research has suggested that memory impairment is especially important in the early detection of dementia or in the progression to Alzheimer's disease,[11,12] while other studies have found that verbal tasks[13] and the number of impaired cognitive domains[14,15] are important. Dysfunction in domains other than memory may be an early sign of vascular or other non-Alzheimer dementias.[16] Executive function and memory may influence activities of daily living,[7] and impaired processing speed and executive function have been associated with an increased risk of falls.[4,17]

Using data from the 2009 Canadian Community Health Survey (CCHS)—Healthy Aging Cognition Module, this study examines correlates of low performance on four cognitive tasks among Canadians aged 65 or older who were living in private dwellings and who did not have Alzheimer's disease or dementia (see *The data*). Low performance on these four cognitive tasks is analyzed in relation to socio-demographic characteristics and measures of health status and well-being.

The Cognition Module

Respondents to the Cognition Module of the 2009 CCHS–Healthy Aging were asked to perform four tasks.

Two tasks—immediate and delayed recall of a list of words—measured short-term verbal memory, verbal learning and post-interference recall.[22,23] Respondents were required to memorize a list of 15 common, unrelated words (for example, drum, curtain), recall them immediately, and again, after about five minutes. The delayed recall was performed after the other cognitive tasks.

The two other tasks—semantic fluency and the Mental Alternation Test—measured executive function. To assess semantic fluency,[24,25] respondents were asked to recall as many names as possible from a specified category (animals) in one minute.[26] For the Mental Alternation Test.[27-29] respondents recited the alphabet, and then counted from 1 to 26. They then had 30 seconds in which to alternate between number and letters in the format 1-A-2-B-3-C, etc.

Five cognitive functioning categories based on normative values that adjust for age, sex and education were previously created and validated for the household population aged 45 or older.[19] In this

The data

The data are from the Cognition Module of the 2009 Canadian Community Health Survey (CCHS)—Healthy Aging. The sampling frame consisted of people aged 45 or older living in private dwellings in the ten provinces. Residents of the three territories, Indian reserves, Crown lands, institutions and some remote regions, and full-time members of the Canadian Forces were excluded. Data collection took place from December 2008 through November 2009 using Computer-Assisted Personal Interviewing.

The Cognition Module was administered in English or French only to non-proxy respondents. This differed from the main component of the CCHS, for which proxy responses were accepted if the mental or physical health of selected participants prevented them from completing the interview (2.2% of the sample). Respondents excluded from the Cognition Module because they required a proxy reporter were more likely to have Alzheimer's disease or dementia or to have suffered a stroke than were those who did not need a proxy reporter.[19] Exclusion of such respondents means that the cognitive functioning categories were created from a higher-functioning sample.[20] As well, because residents of long-term health care institutions (7% of seniors)[18] were excluded from the CCHS, the sample becomes less representative of the entire senior population at successively older ages.

Other reasons why respondents were excluded from the Cognition Module included interviews by telephone, completion of the survey in a language other than English or French (non-proxy), and refusal to perform the trials.

The overall response rate to the Cognition Module was 62.3% (N = 25,864), compared with 74.4% for the entire sample. Separate sampling weights were created specifically for use with the cognitive outcome variables.

This study is based on 13,176 people aged 65 or older who did not report a diagnosis of Alzheimer's disease or dementia and who completed the Cognition Module, representing a weighted population of 4.3 million. In this sample, 81.8% responded to the immediate recall, 68.1% to the delayed recall, 91.3% to semantic fluency (animal-naming), and 88.0% to the Mental Alteration Test. Missing responses were excluded from prevalence estimates for each task. Standard errors in modelling were computed using a bootstrapping technique.[21]

Household income quintiles were defined: lowest, low-middle, middle, high-middle and highest.

The *living arrangements* of respondents were classified as: living alone, living with a spouse/partner, or other.

The presence of *chronic conditions* was established by asking respondents if a health professional had diagnosed them as having conditions that had lasted, or were expected to last, at least six months. Respondents were read a list of conditions. Chronic conditions were self-reported and were not verified by an external source.

Based on *body mass index (BMI)* calculated from self-reported height and weight, respondents were classified as: obese (BMI 30 kg/m^2 or more), overweight (BMI 25 to less than 30 kg/m^2), normal weight (BMI 18.5 to less than 25 kg/m^2), or underweight (BMI less than 18.5 kg/m^2).

Respondents were identified as having had a *single fall* or *recurrent falls* (two or more) based on the questions, "In the past 12 months, did you have any falls?" and "How many times have you fallen in the past 12 months?"

Questions about respondents' ability to perform *instrumental and basic activities* were based on the OARS Multidimensional Assessment Questionnaire.[30] For this analysis, answers were grouped to identify respondents with mild impairment versus moderate/severe/total impairment.

Respondents who received *home care* in the past 12 months were categorized as those who received formal care only, informal care only, or both.

Frequent social participation was defined as at least weekly participation in at least one of eight community-related activities that included other people.

Respondents were asked how often they lacked companionship, felt left out, or felt isolated. For this analysis, those who answered "some of the time" or "often" versus "hardly ever" on each of the three questions were classified as *lonely*.

Self-perceived health was based on the question, "In general, would you say your health is: ..." Those who responded good, very good or excellent (versus fair or poor) were defined as having "positive" self-perceived health. A similar question was used for *self-perceived mental health*.

analysis, for each cognitive task, scores in the two lowest categories (about 30% of respondents) were used to identify respondents with *low cognitive performance*.

Low income/Living alone

The socio-economic characteristics of people aged 65 or older with low cognitive performance differed from those of people whose scores were higher. Seniors with low scores on each task were more likely than were seniors with higher scores to be in the lowest income group (Table 1). They were less likely to be living with a partner and

Table 1
Selected socio-demographic, health and well-being characteristics, by score† on cognitive functioning tasks, household population aged 65 or older without Alzheimer's disease or dementia, Canada excluding territories, 2009

	Score on cognitive functioning tasks							
	First recall		Second recall		Semantic fluency		Processing speed	
Characteristic	Low	Moderate/ High‡	Low	Moderate/ High‡	Low	Moderate/ High‡	Low	Moderate/ High‡
Socio-demographic								
Household income								
Lowest	38.2**	29.8	37.3**	28.1	35.3**	30.1	37.6**	28.3
Low-middle	23.4**	28.6	26.2	27.7	27.5	27.1	28.7	26.4
Middle	18.7	19.0	16.3**	20.3	17.9	20.0	17.4*	20.6
High-midlle	11.7	13.1	11.1*	14.0	12.7	13.1	9.9**	14.4
Highest	8.0	9.5	9.2	9.9	6.6**	9.8	6.5**	10.3
Living arrangements								
Alone	33.1*	29.6	32.8*	29.4	31.5	30.9	33.2*	30.2
With partner	54.5**	61.4	56.4**	62.3	57.4	60.1	56.0**	60.8
Other	12.4**	9.0	10.9*	8.4	11.1*	9.0	10.8*	9.0
Health								
Chronic condition								
Diabetes	20.1**	15.5	19.3**	15.3	19.4**	15.6	19.4**	15.5
Heart disease	23.0	21.9	22.3	21.4	22.9	22.6	24.6*	21.8
High blood pressure	53.6	51.3	52.3	52.0	53.3	52.6	53.8	52.5
Mood/Anxiety disorder	8.4	7.3	8.9	7.3	7.1	7.2	6.7	7.3
Body mass Index								
Underweight	2.2E	2.5	1.7	2.0	3.6**	1.8	3.2*	1.9
Normal weight	42.2	39.5	40.5	40.7	41.2	40.5	40.5	41.0
Overweight	35.5**	39.5	37.7	38.7	36.4	38.6	36.1	38.8
Obese	20.1	18.5	20.0	18.6	18.8	19.0	20.3	18.3
Well-being								
Fall in past year								
Single	12.3	13.1	13.7	13.2	13.3	12.7	12.7	12.9
Recurrent	8.1*	6.1	5.9	6.6	7.5	6.7	7.7	6.7
Impairment in basic and instrumental activities								
Mild	16.6*	14.2	16.9**	13.3	16.5*	14.2	16.5**	13.8
Moderate/Severe	6.3**	3.1	5.3**	2.8	7.4**	3.9	6.9**	3.9
Receiving home care								
Formal	4.1	4.1	4.3	3.8	5.9*	4.1	5.2	4.4
Informal	12.4	11.1	12.7	10.6	11.4	12.2	12.1	11.8
Both	7.2*	5.7	8.0**	5.1	8.3**	5.7	7.6*	6.0
Frequent social participation	74.1**	78.4	77.2	78.7	75.9	77.7	74.1**	78.8
Lonely	13.9**	10.4	12.5	10.4	13.3**	10.4	13.5**	10.2
Positive self-perceived health	73.1**	81.0	75.7**	81.8	74.9**	80.2	73.2**	81.7
Positive self-perceived mental health	92.1**	96.0	94.0**	96.1	93.1**	95.8	93.0**	96.1

† adjusted for age, sex and education
‡ reference category
* significantly different from estimate for reference category ($p<0.05$)
** significantly different from estimate for reference category ($p<0.01$)
E use with caution
Source: 2009 Canadian Community Health Survey–Healthy Aging Cognition Module.

more likely to live alone or to have other living arrangements, compared with seniors with moderate/high cognitive performance scores.

Chronic conditions

Vascular conditions[31,32] and psychiatric disorders[33,34] have been associated with low cognitive function. In this study, seniors with low scores on each of the four tasks were more likely than those with higher scores to have been diagnosed with diabetes, a relationship that persisted even after accounting for socio-demographic and other health variables (data not shown). As well, seniors with low scores on the processing speed task were more likely than those with higher scores to have heart disease. However, no association between low performance on any cognitive task and high blood pressure or mood/anxiety disorders was apparent.

Body mass index

A high BMI or being underweight has been associated with cognitive impairment later in life.[35] Although only current height and weight were reported to the 2009 CCHS, seniors with low immediate recall scores were less likely than those with higher scores to be overweight. As well, seniors with low scores on the semantic fluency and processing speed tasks were more likely than those with higher scores to be underweight.

Falls, impairment and home care

A low score on the first recall task was associated with having had recurrent falls in the past year, but none of the cognitive tasks was associated with having had a single fall. These findings are contrary to previous research that found both single and recurrent falls to be related to processing speed and executive function.[17]

For each cognitive task, seniors with low scores were significantly more likely than those with high scores to report impairment in performing instrumental and basic activities. However, the relationship between mild or moderate/severe impairment and the first recall task, and between mild impairment and the processing speed task did not persist when socio-demographic factors and chronic conditions were taken into account (data not shown).

Low scores on each cognitive task were associated with receiving a combination of formal and informal home care; only the semantic fluency task was associated with receiving formal home care alone. Of course, home care needs may reflect physical as well as cognitive conditions. In multivariate analyses that controlled for socio-demographic factors, chronic conditions and aspects of physical function (pain, mobility, vision or hearing problems), the association between low cognitive performance and receiving both types of home care persisted for the second recall and semantic fluency tasks, and between receiving formal home care alone and semantic fluency (data not shown).

Social interaction

Social interaction is protective against cognitive decline, and infrequent social participation may be an early sign of declining cognitive function.[36] Although the temporal order cannot be established, results from the CCHS—Healthy Aging show that seniors with low scores on the first recall or processing speed task were less likely than those with higher scores to report frequent participation in community-related events, and they were more likely to be lonely, even when other factors were taken into account (data not shown). An apparent association between loneliness and semantic fluency did not persist in multivariate models.

Self-perceived health

Regardless of how they scored on the cognitive tasks, large majorities of seniors perceived their general (at least three-quarters) or mental (over 90%) health as positive. However, for each task, seniors with low scores were less likely than those with higher scores to rate their health positively. This result persisted when socio-demographic factors, chronic conditions and functional impairment were taken into account (data not shown), with the exception of the second recall and perceived general health.

Conclusion

Seniors with low scores on the various cognitive tasks were more likely than those with higher scores to experience poor outcomes on several measures of health and well-being. The cognitive health of non-institutionalized seniors and the factors associated with it are important for health care planning and policy development. Findings from the CCHS—Healthy Aging Cognition Module contribute to an understanding of the socio-demographic and health characteristics and the needs of seniors free of Alzheimer's disease or dementia who continue to live in private households, but whose performance on four tasks commonly used to assess cognition is low. ■

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